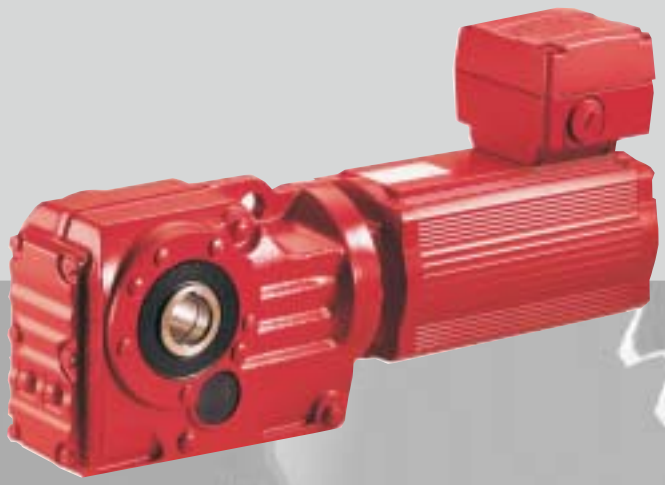
SEW EURODRIVE

Aseptic Drives

Edition

11/2003



Operating Instructions

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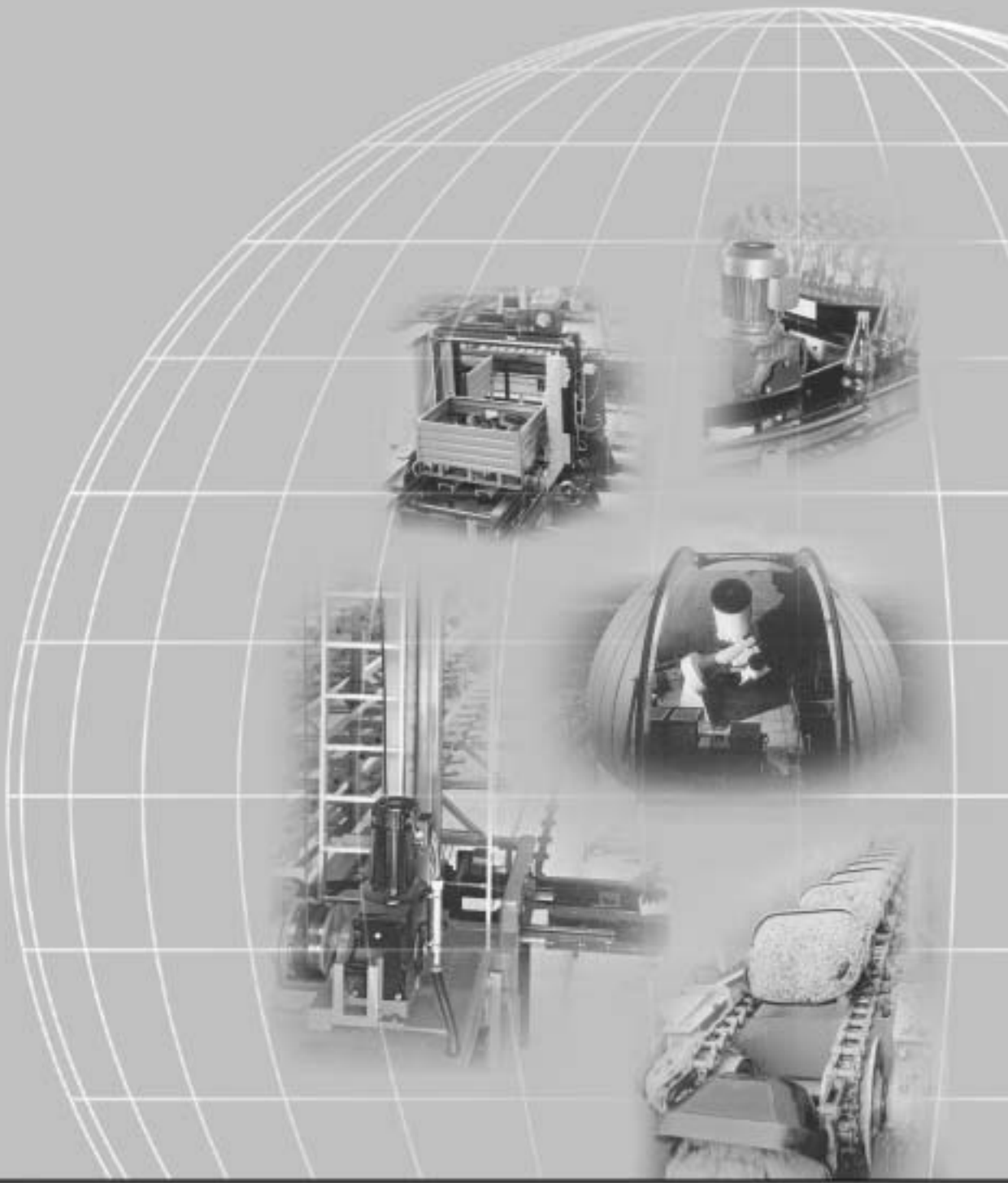

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1 Important Notes

Safety and warning instructions

Always observe the safety and warning instructions in this publication!

Electrical hazard
Possible consequences: Severe or fatal injuries.

Hazard
Possible consequences: Severe or fatal injuries.

Hazardous situation
Possible consequences: Slight or minor injuries.

Harmful situation
Possible consequences: Damage to the drive and the environment.

Tips and useful information.

A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that the information in the operating instructions is adhered to. Consequently, read the operating instructions before you start operating the drive!

The operating instructions contain important information about servicing and should be kept close to the unit.

Waste disposal

This product consists of:

- Iron
- Aluminum
- Copper
- Plastic
- Electronic components

Please dispose of the parts in accordance with the applicable regulations.

2 Safety Notes

Preliminary remarks

The following safety notes are concerned with the use of motors. If using **gearmotors**, also refer to the safety notes for gear units in the corresponding operating instructions.

Please also observe the supplementary safety notes in the individual sections of these operating instructions.

General information

During and after operation, motors and gearmotors have live and moving parts and their surfaces may be hot.

All work related to transport, putting into storage, setting up/mounting, connection, startup, maintenance and repair may only be performed by trained personnel observing

- the corresponding detailed operating instruction(s) and wiring diagrams,
- the warning and safety signs on the motor/gearmotor,
- the specific regulations and requirements for the system and
- national/regional regulations governing safety and the prevention of accidents.

Severe injuries and damage to property may result from

- incorrect use,
- incorrect installation or operation,
- removal of required protective covers or the housing when this is not permitted.

Designated use

These electric motors are intended for industrial systems. They comply with the applicable standards and regulations and meet the requirements of the Low Voltage Directive 73/23/EEC.

The technical data and the information about permitted conditions are to be found on the nameplate and in the documentation.

When using cleaning agents, ensure that they are compatible with the sealing compounds listed in section 9.

It is essential to observe all specified information!

Transportation

Inspect the shipment for any damage in transit as soon as you receive the delivery. Inform the shipping company immediately. It may be necessary to preclude startup.

Tighten installed transportation lugs. They are only rated for the weight of the motor/ gearmotor; do not attach any additional loads.

The installed lifting eyebolts comply with DIN 580. The loads and regulations specified in that document must always be observed. If the gearmotor is equipped with two suspension eye lugs or lifting eyebolts, then both of the suspension eye lugs should be used for transportation. In this case, the tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

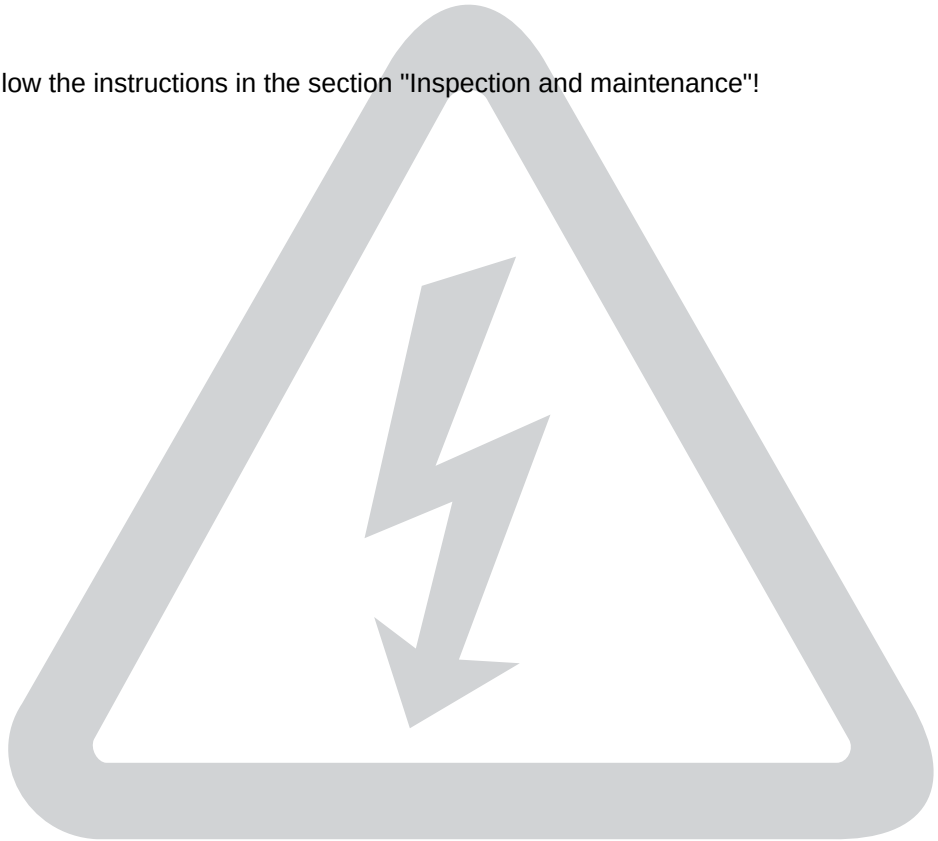
Use suitable, sufficiently rated handling equipment if necessary. Remove any transportation fixtures prior to startup.

Installation / mounting

Follow the instructions in the section "Mechanical Installation"!

Inspection / maintenance

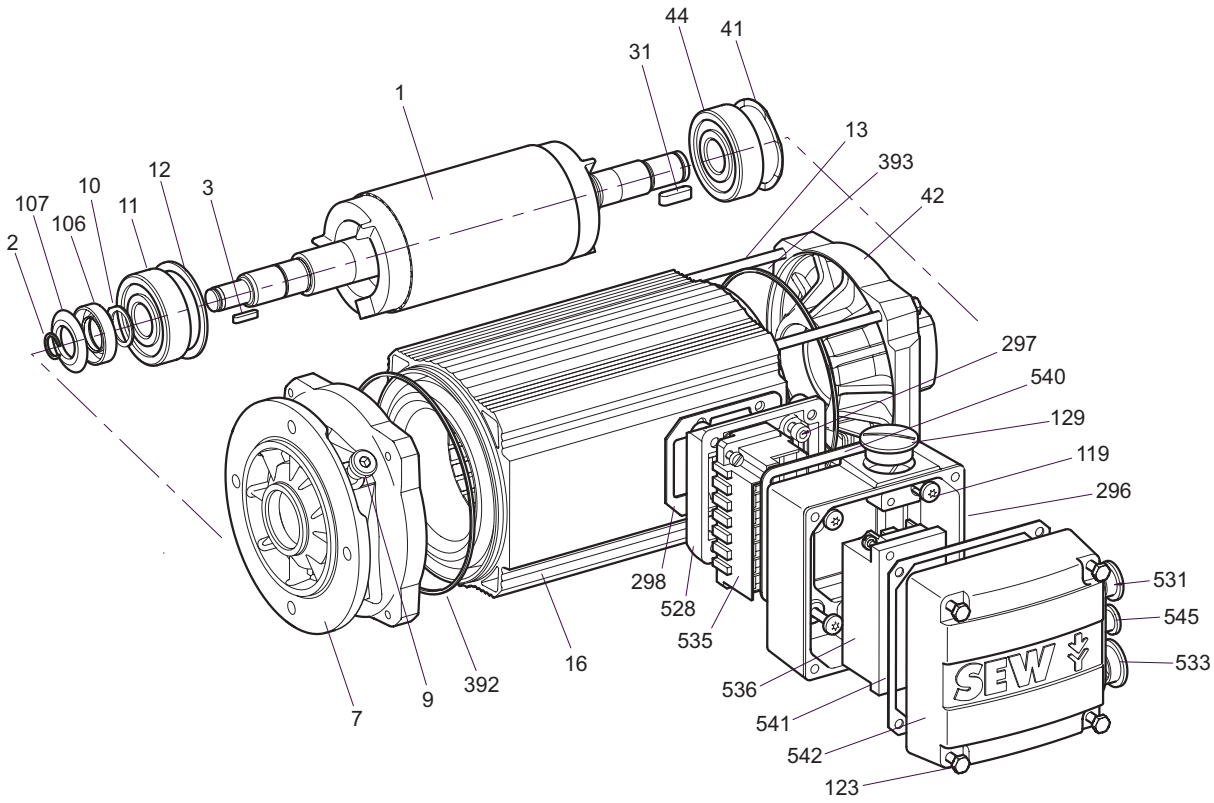
Follow the instructions in the section "Inspection and maintenance"!



3 Motor design

The following illustration shows the basic design of the motor. Its only purpose is to facilitate the assignment of components to the spare parts lists. Discrepancies are possible depending on the motor size and version!

3.1 Basic design of the aseptic motor



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[1]	Rotor	[42]	Non drive-end bearing shield	[393]	O-ring
[2]	Circlip	[44]	Grooved ball bearing	[528]	Adapter plate
[3]	Key	[100]	Hex nut	[531]	Screw plug
[7]	Flanged end shield	[106]	Oil seal	[533]	Screw plug
[9]	Screw plug	[107]	Oil-flinger ring	[535]	Plug connector
[10]	Circlip	[119]	Slotted cheese head screw	[536]	Plug connector
[11]	Grooved ball bearing	[123]	Hex head screw	[540]	IS adapter plate gasket
[12]	Circlip	[129]	Screw plug	[541]	Gasket
[13]	Hex head screw	[296]	Adapter plate IS	[542]	Terminal box cover
[16]	Stator	[297]	Slotted cheese head screw	[545]	Screw plug
[31]	Key	[298]	Adapter plate gasket		
[41]	Equalizing ring	[392]	O-ring		

3.2 Nameplate, unit designation

Nameplate

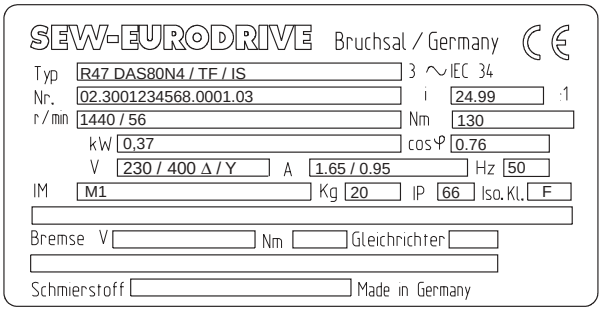

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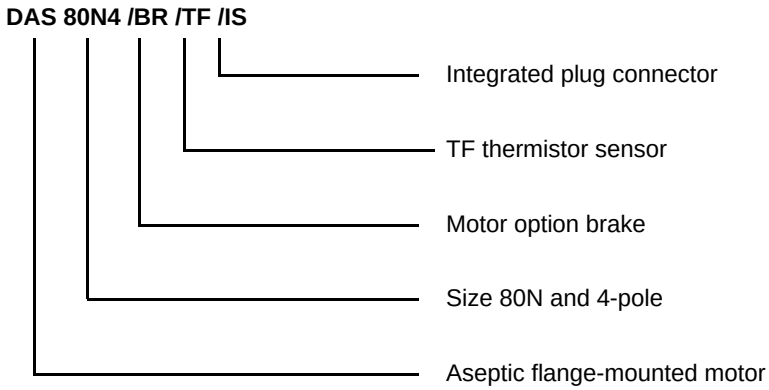
Figure 1: Sample nameplate

Unit designation

Examples: AC (brake) motors DAS



Example: Serial number

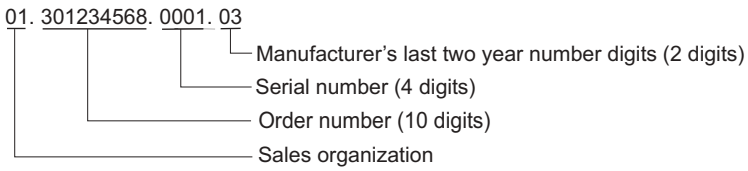

01. 301234568. 0001. 03
Manufacturer's last two year number digits (2 digits)
Serial number (4 digits)
Order number (10 digits)
Sales organization

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Figure 2: Serial number

4 Mechanical Installation

It is essential to observe the safety notes in section 2 during installation!

4.1 Before you begin

The drive may only be installed if

- the entries on the nameplate of the drive and/or the output voltage of the frequency inverter match the voltage supply system,
- the drive is undamaged (no damage caused by transportation or storage),
- it is certain that the following requirements have been met:
  - Ambient temperature between –25 °C and +40 °C,[1)]
  - Installation altitude max. 1000 m above sea level.

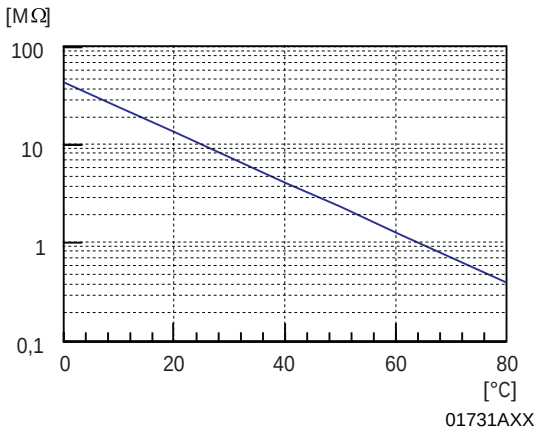
4.2 Preliminary work

Motor shaft ends must be thoroughly cleaned of anti-corrosion agents, contamination or such like (use a commercially available solvent). Do not allow the solvent to penetrate the bearings or shaft seals – this could cause material damage!

Extended storage of motors

- Please note the reduced grease utilization period of the ball bearings after storage periods exceeding one year.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance to do this (measuring voltage 500 V).

The insulation resistance (→ following figure) varies greatly depending on the temperature! The motor must be dried if the insulation resistance is not adequate.



1) Note that the temperature range of the gear unit may also be restricted (→ gear unit operating instructions)

4.3 Installing the motor

The motor or gearmotor may only be mounted or installed in the specified mounting position on a level and torsionally rigid support structure that is not subject to shocks.

Carefully align the motor and the driven machine to avoid placing any unacceptable strain on the output shafts (observe permitted overhung load and axial load!).

Do not butt or hammer the shaft end.

Ensure an unobstructed cooling air supply.

Balance components for subsequent mounting on the shaft with a half key (motor shafts are balanced with a half key).

Installation in damp locations or in the open

If possible, arrange the terminal box so the cable entries are pointing downwards.

Coat the threads of cable glands and pocket caps with sealant and tighten them well.

Seal the cable entry well.

Thoroughly clean the sealing surfaces of terminal boxes and terminal box covers prior to reassembly; gaskets must be glued in on one side. Install new gaskets to replace embrittled ones!

Restore the anticorrosive coating if necessary.

4.4 Installation tolerances

Shaft end	Flanges
Diameter tolerance in accordance with DIN 748 • ISO k6 at Ø ≤ 50 mm • ISO m6 at Ø > 50 mm • Center bore in accordance with DIN 332, shape DR..	Centering shoulder tolerance in accordance with DIN 42948 • ISO j6 at Ø ≤ 230 mm • ISO h6 at Ø > 230 mm

5 Electrical Installation

It is essential to comply with the safety notes in section 2 during installation!

Switch contacts in utilization category AC-3 to EN 60947-4-1 must be used for switching the motor and the brake.

5.1 Wiring notes

Comply with the safety notes during installation.

Protection against interference from brake control systems

Do not route brake cables alongside switched-mode power cables, since otherwise there is a risk of disrupting brake controllers.

Switched-mode power cables include in particular:

– Output cables from frequency and servo controllers, soft start units and brake units
– Connecting harnesses to braking resistors, etc.

Protection against interference from motor protection devices

To provide protection against interference from SEW motor protection devices (temperature sensors TF):

– Route separately shielded feeder cables together with switched-mode power lines in one cable.
– Do not route unshielded feeder cables together with switched-mode power lines in one cable.

5.2 Special aspects for operation with a frequency inverter

When motors are powered from inverters, you must adhere to the wiring instructions issued by the inverter manufacturer. It is essential to observe the operating instructions for the frequency inverter.

5.3 Special aspects in switching operation

When the motors are used in switching operation, any possible malfunctions of the switchgear must be excluded by appropriate wiring. According to EN 60204 (electrical equipment of machines), motor windings must have interference suppression to protect the numerical or programmable logic controllers. Since it is primarily switching operations that lead to the disruptions, we recommend installing protective circuitry on the switching devices.

5.4 Connecting the motor using the IS plug connector

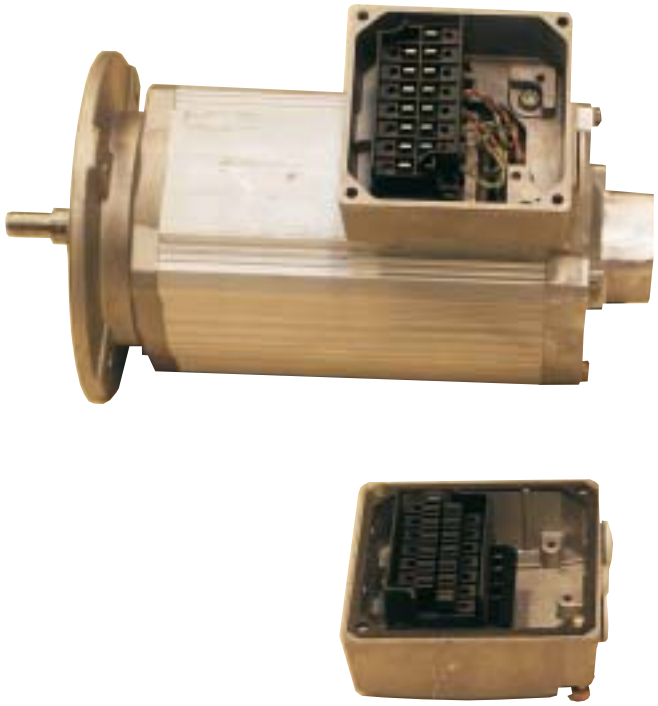


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Figure 3: IS plug connector

The IS plug connector is supplied from the factory with its base fully wired-up, including additional features such as a brake rectifier. The upper section of the IS connector is included in the scope of delivery and must be connected as shown in the wiring diagram.

The IS plug connector has CSA approval up to 600 V. (Note for application according to CSA regulations: Tighten the M3 terminal screws to a torque of 0.5 Nm! See the following table for American Wire Gauge (AWG) line cross sections!)

Line cross section

Make sure the type of line corresponds to the applicable regulations. The rated currents are specified on the motor nameplate. The line cross sections that can be used are listed in the following table.

Without variable terminal link	With variable terminal link	Link cable	Double assignment (motor and brake/SR)
0.25 - 4.0 mm^2	0.25 - 2.5 mm^2	max. 1.5 mm^2	max. 1 x 2.5 and 1 x 1.5 mm^2
23 - 12 # AWG	23 - 14 # AWG	max. 16 # AWG	max. 1 x 14 # and 1 x 16 # AWG

Wiring the upper section of the plug connection

- Loosen the housing cover screws
  - Remove the housing cover
- Remove the screws from the upper section of the plug connector
  - Remove the upper section of the plug connector from the cover
- Strip the insulation off the connection lead
  - Strip about 9 mm insulation off the connecting leads
- Pass the cable through the cable gland

Wiring up as shown in wiring diagram DT81

For ⅄ / △ startup:

- Connect with 6 lines
  - Tighten the clamping screws carefully!
  - Motor contactors in the switch cabinet
- Install the plug connector (→ Sec. 'Installing the plug connector')

For ⅄ or △ operation:

- Connect as shown in the wiring diagram
- Install the variable terminal link as shown in the following figures according to the required motor operation (△ or ⅄)
- Install the plug connector (→ Sec. 'Installing the plug connector')

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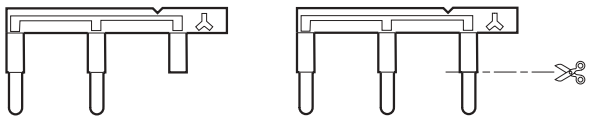
Brake control system BSR – Preparing the variable terminal link

For ⅄ operation:

On the ⅄ side of the variable terminal link as shown in the following figure: Remove only the bare metal pin of the marked prong horizontally – touch guard!



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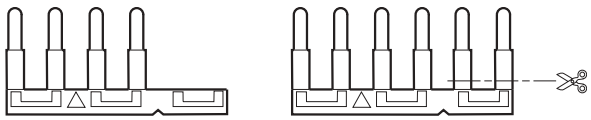
For △ operation:

On the △ side of the variable terminal link as shown in the following figure: Completely remove two prongs horizontally.



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Wiring according to the DT81 wiring diagram for ⅄ or △ operation with double terminal assignment

- At terminal point for double assignment:
  - Connect the link cable
- When operation is as required:
  - Insert the link cable in the variable terminal link
- Install the variable terminal link
- At terminal point for double assignment:
  - Connect the motor lead above the variable terminal link
- Connect the other lines as shown in the wiring diagram
- Install the plug connector (→ Sec. 'Installing the plug connector')

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Installing the plug connector

The housing cover of the IS plug connector can be screwed onto the lower section of the plug connector depending on the required position of the cable lead. The upper section of the plug connector shown in the following figure must first be installed in the housing cover so it will match the position of the lower section of the plug connector:

- Define the required mounting position
- Install the upper section of the plug connector into the housing cover in accordance with the mounting position
- Close the plug connector
- Tighten the cable gland

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Mounting position of the upper section of the plug connector in the housing cover

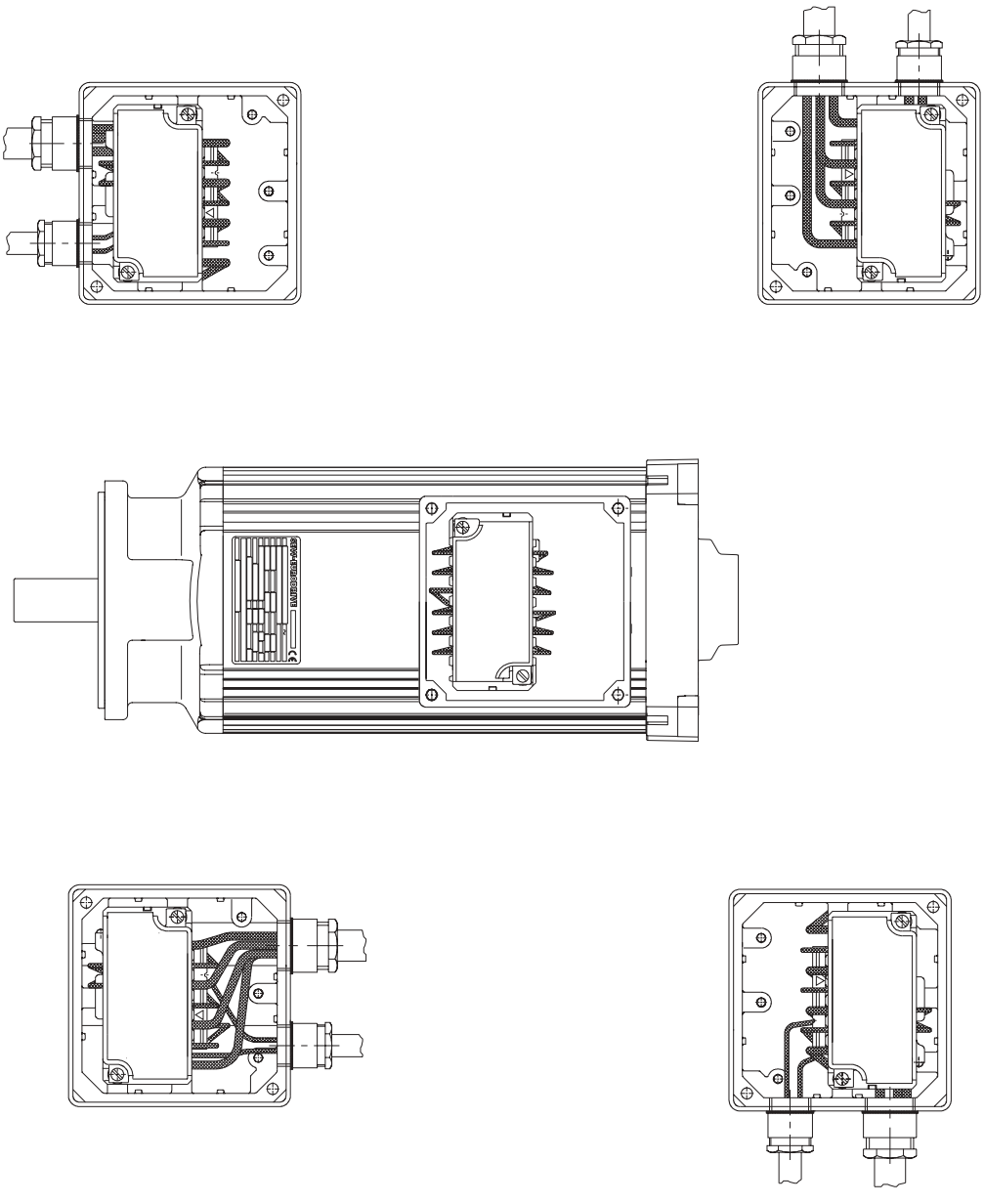

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Figure 4: Mounting position of the plug connector

5.5 Connecting the brake

The brake is released electrically. The brake is applied mechanically when the voltage is switched off.

Comply with the applicable regulations issued by the relevant employer's liability insurance association regarding phase failure protection and the associated circuit/circuit modification!

- Connect the brake according to the wiring diagram supplied with the brake.
- **Note:** In view of the DC voltage to be switched and the high level of current load, it is essential to use either special brake contactors or AC contactors with contacts in utilization category AC-3 to EN 60947-4-1.
- After replacing the brake disc, the maximum braking torque is reached only after several cycle times.

Connecting the brake control system

The DC disk brake is powered from a brake control system with a protection circuit. This control is accommodated in the terminal box / IS lower part or must be installed in the switch cabinet (→ Sec. 'Wiring notes').

- **Check the line cross sections - braking currents (→ Sec. 'Technical Data')**
- Connect the brake control system according to the wiring diagram supplied with the brake

5.6 Accessory equipment

Connect supplied accessory equipment according to the wiring diagrams included.

Temperature sensor TF

Do not apply any voltage!

The positive temperature coefficient (PTC) thermistors comply with DIN 44082.

Resistance measurement (measuring instrument with V ≤ 2.5 V or I < 1 mA):

- Standard measured values: 20...500 Ω, thermal resistance > 4000 Ω

6 Startup

6.1 Prerequisites for startup

It is essential to comply with the safety notes in section 2 during startup!

Before startup, make sure that

- the drive is undamaged and not blocked,
- the measures stipulated in the "Preliminary work" section are performed after extended storage,
- all connections have been made properly,
- the direction of rotation of the motor/gearmotor is correct,
  - (motor rotating clockwise: U, V, W to L1, L2, L3),
- all protective covers have been installed correctly,
- all motor protection equipment is active and set for the rated motor current,
- there are no other sources of danger present.

During startup, make sure that

- the motor is running correctly (no overload, no speed fluctuation, no loud noises, etc.),
- the correct braking torque is set according to the specific application (→Sec. "Technical Data"),
- in case of problems (→ Sec. "Malfunctions").

7 Malfunctions

7.1 Motor problems

Problem	Possible cause	Remedy
Motor does not start up	Interruption in connecting harness	Check connections, correct if necessary
	Brake does not release	→ Sec. "Brake Problems"
	Fuse blown	Replace fuse
	Motor protection has tripped	Check motor protection for correct setting, correct error if necessary.
	Motor protection does not switch, error in control	Check motor protection control, correct error if necessary.
Motor does not start or only with difficulty	Motor designed for delta connection but used in star connection	Correct circuit
	Voltage and frequency deviate markedly from setpoint, at least during switch-on	Provide better power supply system; check cross section of connecting harness
Motor does not start in star connection, only in delta connection	Torque not sufficient in star connection	Switch on directly if delta inrush current is not too great; otherwise use a larger motor or a special version (contact SEW)
	Contact fault on star delta switch	Rectify fault
Incorrect direction of rotation	Motor connected incorrectly	Swap over two phases
Motor hums and has high current consumption	Brake does not release	→ Sec. "Brake Problems"
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	
Fuses blow or motor protection trips immediately	Short circuit in line	Rectify short circuit
	Short circuit in motor	Send motor to specialist workshop for repair
	Lines connected incorrectly	Correct circuit
	Ground fault on motor	Send motor to specialist workshop for repair
Severe speed loss under load	Overload	Perform power measurement, use larger motor or reduce load if necessary
	Voltage drops	Increase cross section of connecting harness
Motor heats up >70K	Overload	Perform power measurement, use larger motor or reduce load if necessary
	Inadequate cooling	Improve cooling air supply
	Ambient temperature too high	Adhere to permitted temperature range
	Use delta connection for motor rather than star connection as provided for	Correct circuit
	Loose contact in connecting harness (one phase missing)	Rectify loose contact
	Fuse blown	Look for and rectify cause (see above); replace fuse
	Supply voltage deviates from rated motor voltage by more than 5 %. A higher voltage has a particularly unfavorable effect in motors with a low-speed winding since in these, the no-load current is already close to the rated current even when the voltage is normal.	Adapt motor to supply voltage
	Rated operation type (S1 to S10, DIN 57530) exceeded, e.g. due to excessive starting frequency	Adjust rated operation type of motor to required operating conditions; if necessary call in a specialist to determine correct drive
Excessively loud	Ball bearing compressed, contaminated or damaged	Re-align motor, inspect ball bearing (→ Sec. "Used ball bearing types") and replace if necessary
	Vibration of rotating parts	Rectify cause, possibly imbalance

7.2 Brake problems

Problem	Possible cause	Remedy
Brake does not release	Incorrect voltage on brake control unit	Apply correct voltage
	Brake control unit failed	Install a new brake control system, check internal resistance and insulation of brake coil, check switchgear
	Max. permitted working air gap exceeded because brake lining worn down	Replace complete brake
	Voltage drop on connecting harness > 10 %	Provide for correct connection voltage; check cable cross section
	Inadequate cooling, brake overheats	Improve air supply
	Brake coil has interturn fault or short circuit to exposed conductive part	Replace complete brake and brake control system (specialist workshop), check switchgear
Motor does not brake	Brake lining worn down	Replace complete brake
	Incorrect braking torque	Change the braking torque (→ Sec. "Technical Data") • by the type and number of brake springs
Brake is applied with time lag	Brake is switched on AC voltage side	Switch on DC and AC voltage sides (e.g. BSR); please refer to wiring diagram
Noise in the brake area	Pulsating torques due to incorrectly set frequency inverter	Check/correct setting of frequency inverter according to operating instructions

7.3 Malfunctions when operating with a frequency inverter

The symptoms described in the "Motor Problems " section may also occur when the motor is operated with a frequency inverter. Please refer to the frequency inverter operating instructions for the significance of the problems which occur and to find information about rectifying the problems.

Customer service

Please have the following information to hand if you require the assistance of our customer service:
- Nameplate data (complete)
- Nature and extent of the fault
- Time and peripheral circumstances of the fault
- Presumed cause

8 Inspection / Maintenance

- **Use only genuine spare parts in accordance with the valid parts list!**
- **Motors can become very hot during operation – danger of burns!**
- **Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!**

8.1 Inspection and maintenance intervals

Unit / component	Frequency	What to do
Brake • **BR1** • **BR2**	• **If used as a working brake:** At least every 3000 hours of operation[1)]	Inspect the brake • Measure the brake disk thickness • Brake disk, lining • Pressure plate • Carrier / gearing
Brake • **BR1** • **BR2**	• **If used as a holding brake:** Every 2 to 4 years, depending on operating conditions[1)]	Inspect the brake • Extract the abraded matter
Motor	• **Every 10,000 hours of operation**	Inspect the motor: • Check ball bearings and replace if necessary • Replace the oil seal
Drive	• Varies (depending on external factors)	• Touch up or renew the surface/ anticorrosion coating

1) The periods of wear are affected by many factors and may be short. The machine designer must calculate the required inspection/ maintenance intervals individually in accordance with the project planning documents (e.g. Drive Engineering - Practical Implementation, Vol. 4).

8.2 Inspection and maintenance of the brake BR

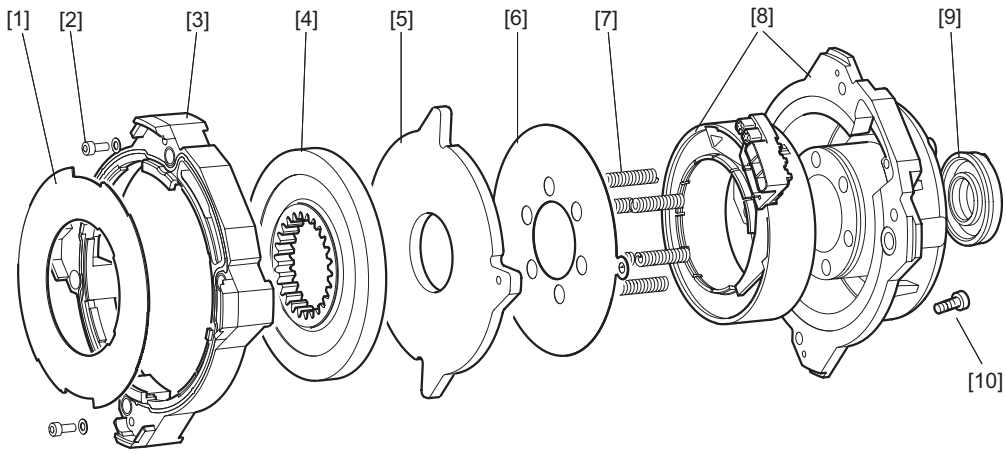

Figure 5: Design of the brake

[1] Friction plate
[2] Bolt
[3] Guide ring
[4] Brake disk
[5] Pressure plate with stud
[6] Damping plate
[7] Brake springs
[8] Brake coil body
[9] Sealing washer
[10] Bolt

Altering the braking torque BR

The braking torque can be changed in steps (→ Sec. "Braking Torques BR1, BR2")

- by installing different brake springs
- by changing the number of brake springs

1. **Isolate the motor and brake from the supply, safeguarding them against unintentional power-up!**
2. Remove the encoder housing [11] with cover [12] (→ see Figure 6)
3. Loosen the bolts [10] and remove the complete brake
4. Loosen the screws [2] and remove the guide ring [3] with friction plate [1], brake disk [4], pressure plate [5] and damping plate [6].
5. Remove the brake springs [7] from the brake coil body [8] and replace them by new ones.
6. Position the new brake springs symmetrically.
7. Slide the damping plate [6] over two studs attached to the pressure plate [5] so the embossing pattern is located with the projecting side facing the pressure plate.
8. Pressure plate [5]:
   - Place on the brake springs [6] together with the damping plate [7].
   - Guide the studs attached to the pressure plate [5] through the holes in the brake coil body [8] and make sure the pressure plate is in the correct position.

9. Place the flat side of the brake disk [4] on the pressure plate [8].

   Note: Do not bring the disk into contact with grease or oil!

10. Place the guide ring [3] and friction disk [1] onto the brake disk [4], press down and install the screws [2].
11. Connect the complete brake back onto the motor (→ following figure):
    - Make sure the gearing of the brake disk engages in the gearing of the carrier and that the plug on the motor end fits into the socket on the brake end.

    Mount the brake on the brake end shield [13] using the screw [10].
12. Mount the encoder housing [11] with cover [12].

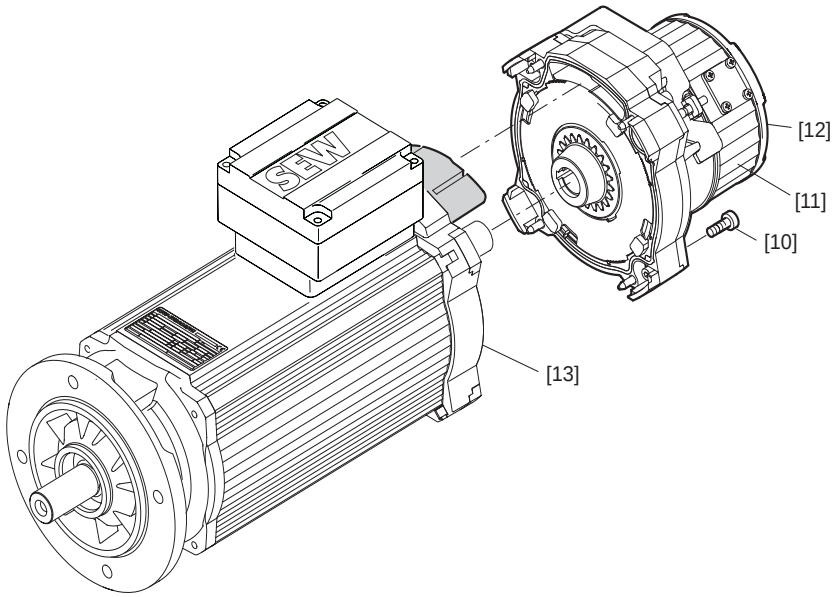

Figure 6: Mount the brake on the motor

[10] Screw
[11] Encoder housing
[12] Cover
[13] Brake end shield

9 Technical Data

9.1 Braking torques BR1, BR2

Brake Type	Motor	Braking torque [Nm]	Work done until maintenance [10^6 J]	Type and no. of springs		Part number	
				Standard	Red	Standard	Red
BR1	DAS80	5 7	60	- 2	6 2	186 662 1	183 742 7
BR2	DAS90 DAS100	14 20	90	2 3	2 -	186 663 X	184 003 7

9.2 Operating currents

The current values I_H (holding current) specified in the tables are r.m.s. values. Use only r.m.s. instruments for your measurement. The inrush current (accelerator current) I_B only flows for a short time (max. 120 ms) when the brake is released or during voltage dips below 70 % of rated voltage. There is no increased inrush current if the BG brake rectifier is used or if there is a direct DC voltage supply – both are possible with brakes up to size BMG4 only.

BR1, BR2 brake

	BR1	BR2
Motor size	DAS80	DAS90 DAS100
Max. braking torque [Nm]	7	20
Braking power [W]	45	55
Inrush current ratio I_B/I_H	4.0	4.0

Rated voltage V_N		BR1	BR2
V_{AC}	V_{DC}	I_H [A_{AC}]	I_H [A_{AC}]
	24	1.5	1.7
110		0.71	0.9
230		0.31	0.39
400		0.18	0.22
460		0.16	0.21

I_B Accelerator current – brief inrush current

I_H Holding current r.m.s. value in the connecting harness to the SEW brake rectifier

V_N Rated voltage (rated voltage range)

9.3 Gear unit gaskets/seals

Designation	Material	
	Standard	Option
Radial oil seal	NBR	75FKM585
Closing cap	NBR	
O-ring	NBR	
Loctite sealing compound	Loctite 574	
Gear unit cover gasket	ANT6800	
Gasket for aluminum motor flange	AMF 38	Paper

9.4 Motor gaskets/seals

Designation	Material	
	Standard	Option
Radial oil seal	75FKM585	NBR
O-ring stator opening	NBR	
O-ring screw plug	NBR	
Encoder flange gasket	MP15-0570	
Housing cover gasket	RN8011	
Adapter plate gasket	RN8011	
Gasket IS lower part	SBR 1704	
Gasket IS cover	SBR 1704	
Nameplate	3M polyester foil 7818	

9.5 Permitted ball bearing types

Motor type	Driving end A-bearing	Non-driving end B-bearing
DAS80...	6303-J-2RS-C3	6303-J-2RS-C3
DAS90...	6306-J-2RS-C3	6305-J-2RS-C3
DAS100...	6306-J-2RS-C3	6305-J-2RS-C3

9.6 Lubricant table for anti-friction bearings of SEW motors

The motor anti-friction bearings are factory-filled with the greases listed below.

	Ambient temperature	Manufacturer	Type
Anti-friction bearing in motor	–40 °C ... +40 °C	Klüber	Asonic GHY72[1)]

1) Synthetic lubricant (= synthetic-based anti-friction bearing grease)

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